

motion that exists must, therefore, be practically irrotational.

THE Journal of the Franklin Institute for February contains a report on recent progress in the chemistry of the terpenes and camphors, by J. S. Hepburn. Similar reports dealing with the sugars and the proteins have appeared in the two preceding years. The present report is based upon Wallach's recently published volume on the "Terpenes and Camphor," and in the space of twenty-five pages gives an excellent summary, which is likely to be of service to those who are unable to make use of the German original.

MR. A. E. PORTER finds that a number of ferments, including pepsin, trypsin, and rennet, are rendered inactive by being kept in contact with artificial membranes, especially with collodion ones. Most ferments which have thus been inactivated have at the same time acquired inhibitive properties. The inactivation of ferments by membranes is not due to simple absorption, for there is no evidence of saturation of the membrane; on the contrary, its inactivating power appears to improve with repeated use. Although the inhibitive power of the inactivated ferments may be due in part to substances preformed in the solution, inhibition is still present after removal of these substances, suggesting that the ferment itself is changed by contact with a membrane into a substance having an inhibiting power on itself (*Quart. Journ. Experiment. Physiol.*, iii., No. 4, December, 1910, p. 375).

THE important discoveries of MM. Paul Sabatier and Senderens on the catalytic action of finely divided metals, notably nickel and copper, have recently been extended to a study of the catalytic action of various metallic oxides. In the current number of the *Comptes rendus* MM. Paul Sabatier and A. Mailhe give an account of a new synthetic method, based on the catalytic effect of titanium oxide, which would appear to possess many practical applications. They show that if a column of titanium dioxide is maintained at a temperature of 280°–300° C., and a mixture of the vapours of a primary alcohol and a fatty acid (other than formic acid) is led over it, the corresponding ester is formed. The same limit is here reached instantaneously as was found by Berthelot after prolonged contact. An excess of either constituent favours the limit of combination of the other. Following this method, the methyl, ethyl, propyl, butyl, isobutyl, and isoamyl esters of acetic, propionic, butyric, isobutyric, isovaleric, and caproic acids have been prepared. Esters of benzyl alcohol have also been readily obtained by this method. The inverse action—the direct hydrolysis of esters by water—is also easily effected, and the use of titanium dioxide reduces any secondary reactions to a negligible amount.

An article on ferro-concrete beams with single reinforcement appears in *Engineering* for March 3, from the pen of Dr. W. C. Unwin. The object of the article is to put the equations of the ordinary theory into the most convenient form for calculation. The ordinary theory is known to be only roughly approximate, but the assumptions made are believed to be generally on the side of safety. The formulæ, however, are still in some cases very complicated, as given in books, due to the attempt to obtain formal exactness from a mathematical point of view. But the data used in solving problems are themselves only approximate; for instance, the selected value of the coefficient of elasticity of concrete, which itself varies with the stress, and the neglect of the tensile stress in the concrete. Hence it would appear that, for practical purposes, a sacrifice of mathematical exactness in the form of the equations is justifi-

able, if the errors are small within a practical range. In fact, some of the equations are only used in designing by making assumptions and proceeding by trial and error, or by the use of tables and curves based more or less on experience. Both rectangular and T sections are dealt with in the article, and examples are given of the use in practice of the simplified formulæ deduced.

A COPY has been received of the first number of the *Irish Review*, a monthly magazine of Irish literature, art, and science. Science is represented only by an article on economics by Mr. George W. Moore, in which he deals with the problem of rural life. The magazine is published in Dublin, and may be obtained in London from Messrs. Simpkin, Marshall, Hamilton, Kent and Co. The price is 6d. net.

THE annual report for 1910 of the Philosophical Institute of Canterbury, New Zealand, shows that the condition of the institute continues to be satisfactory both as regards the number of members and the active interest displayed in those branches of science which constitute its object. The special lines of research outlined in last year's report have been developed, and some have already given good results. These lines of inquiry are:—observations on the Arthur's Pass tunnel; a survey of the Canterbury lakes; and an examination of the Christchurch artesian system. This is quite apart from the original work which has been carried on by individual members of the institute. A sub-committee has also been considering the question of the more adequate protection of the native fauna. Ten meetings of the institute were held during the year, at which the average attendance was sixty-four. At these meetings twenty-seven papers embodying the results of original research were read. These are classified as follows:—botany, four; zoology, seven; geology, five; chemistry, six; physics, two; mathematics, one; miscellaneous, two.

OUR ASTRONOMICAL COLUMN.

THE BRILLIANT METEOR OF FEBRUARY 19.—Mr. W. F. Denning writes:—"A very good observation of this object comes from Mr. Felix de Roy, of Antwerp, who describes the apparent path as from $27^{\circ}+34^{\circ}$ to $11^{\circ}+60^{\circ}$, and onwards to the north-east. He gives the duration as twelve seconds, but this only relates to a portion of the flight. To him the meteor disappeared in a cloud.

"At Putney the object was seen by Mr. F. E. Baxandall, who gives the duration as fifteen seconds, but I do not know whether the newspaper account of his observations includes the course of the meteor. The radiant point appears to have been at $46^{\circ}-15^{\circ}$ in Eridanus, and the heights 70 to 49 miles along a path 590 miles long, and probably this does not include the whole extent of the visible luminous trajectory. Its motion seems to have passed from over the English Channel between Brest and Plymouth to Oldenburg, in Hanover. From Stowmarket the meteor was seen to rise from the south-west horizon, and at Antwerp it was low in the north-east when it disappeared. The meteor may therefore have sailed along in a nearly horizontal flight much further, but it was rising, not falling, to the earth when last seen.

"This meteor, though of such an extended course, is not beyond precedent, for according to the computations of the late Prof. Herschel the fireball of August 18, 1783, had a path of 1000 to 1200 miles; that of September 5, 1868, was watched along 880 miles; while that of July 20, 1860, was traced more than 1000 miles. It will be important to secure observations of the meteor of February 19 from Cornwall or the north-west coast of France, and from Holland and Hanover or that region."

HALLEY'S COMET.—Dr. Ebell publishes a bi-daily ephemeris for Halley's comet, extending to April 30, in No. 4476 of the *Astronomische Nachrichten*. Although the comet is not likely to be observed with ordinary instru-

ments, it is interesting to note that its present position is 10h. 30m., $-13^{\circ} 48.2$, roughly about one-third of the distance from ν towards λ Hydræ; it is travelling north and west, towards Sextans, and its distance from the earth is about 330 million miles. Prof. Barnard's observation, of January 8, gives a correction to Dr. Ebell's ephemeris of $+12s.$, -0.5 , and the ephemeris shows that by April 30 the comet should be about one magnitude fainter than when Prof. Barnard saw it.

THE ANGULAR SPEED OF ROTATION OF A LONG-ENDURING PROMINENCE.—From the study of the Kodaikanal spectroheliograms of a prominence which endured, in more or less the same form, for eighty-two days, Mr. Evershed arrives at some important conclusions, which he publishes in No. 1, vol. xxxiii., of the *Astrophysical Journal*. When first photographed, the prominence was on the western limb, was $55''$ high, and covered from $+2^{\circ}$ to -14° in latitude. Its seventh, and last, "limb" appearance was on April 28, when it was $80''$ high, and extended over latitudes -7° to -23° ; on each occasion, after the first, it was seen for three successive days on the limb. Not only was this object photographed on the limb, it is also seen as an absorption marking on a number of "disc" photographs taken, and is shown as such on the four magnificent photographs reproduced.

Measures of the photographs show that the dark mass of calcium (and hydrogen) vapour near the equator had, during February, a speed 5 per cent. greater than the general surface of the photosphere, and, during the March apparition, a speed 11 per cent. greater. They also indicate that the two apparitions really represent two distinct masses of gas emanating from a common origin in solar longitude 75° . The general aspect and behaviour of the prominence suggest that it was continuously renewed by glowing gas emanating from numerous photospheric orifices.

The enormous activity attending such phenomena is indicated by the fact that, on March 25, the prominence extended over at least 36° of latitude, or was 250,000 miles long, yet twenty-four hours later the whole object had completely vanished.

Radial-velocity measures made when the prominence was on the limb, on March 17 and 18, showed that the prominence, at a considerable height, was moving at a speed 34 per cent. greater than the normal chromosphere, and they suggest that the acceleration of velocity with height, discovered by Adams, may be continued beyond the limits of the chromosphere. The measures were made, with a radial slit set across the limb at the equator, on the $H\alpha$ line, and the difference measured was that between the absorption line, representing the normal chromospheric line, and the bright prominence line.

CONJUNCTIONS OF MAJOR PLANETS AND STARS IN 1911.—According to Prof. Banachiewicz, in No. 4465 of the *Astronomische Nachrichten*, there will be three near conjunctions with Mars and one occultation by Jupiter this year.

On May 3, at 11h. (G.M.T.), Mars will be in conjunction with and $18''$ S. of B.D. $-10^{\circ} 5892$, a star of magnitude 7.5; on May 10, at 12.6h., the planet will pass $0.8''$ S. of the sixth-magnitude, fundamental star h Aquarii, and on August 9, at 11.7h., it will pass within $15.5''$ of the star AG. Lpz. I. 898 (mag. 8.5); it is possible that the unknown proper motion of the star may make this an occultation.

The star B.D. $-12^{\circ} 4042$ (mag. 6.5) will be occulted by Jupiter on August 13 at 0.2h. G.M.T., and the phenomenon will be observable in Australia and eastern Asia.

ASTROPHYSICS IN THE UNITED STATES.—The *Revue générale des Sciences* for February 15 (No. 3) contains a very interesting illustrated article, by M. Bosler, in which the author summarises the recent progress of astrophysical methods in the United States. M. Bosler includes the methods employed at Harvard in the systematic study of the stars and their spectral classification, the radial-velocity and other researches at Mount Hamilton, the multifarious observations made at the Yerkes Observatory, and the great progress in methods, instruments, and knowledge which has taken place at Mount Wilson since the solar observatory was founded on its elevated site. The article

is freely illustrated with photographs, and gives an excellent idea of the great advances made in our knowledge of the universe under the favourable financial and climatic conditions which obtain in the States.

STUDIES OF ALGOL VARIABLES.—The *Journal of the College of Science, Imperial University of Tokio*, for January 18, contains a paper, in English, by Mr. Naozo Ichinohe, in which the author discusses a large number of variable stars of the algol type. After giving a brief historical account, Mr. Ichinohe defines an algol variable, and then gives a list of ninety-three stars which conform to his definitions. He then discusses the periods, densities, distribution, magnitudes, spectra, &c., and, with a number of tables, makes up a useful epitome of our knowledge concerning this type of star.

THE SPECTROSCOPIC BINARY α HERCULIS.—In 1848, the star α Herculis was suspected by Schmidt to vary; but its light-changes were puzzling, and it was not until 1869 that he concluded it to be a variable, with a period of about forty days, which at minimum suffered rapid changes. Frost and Adams, in 1903, showed the star to be a spectroscopic binary.

In No. 9, vol. ii., of the *Publications of the Allegheny observatory*, Dr. Baker discusses the radial velocities of this star, determined from spectrograms taken with the Mellon spectrograph, and finds it to be an eclipsing variable of the β Lyræ type, with a period of 2.051 days, and a secondary minimum about a day later. The presence of this secondary minimum, and the presence of the fainter spectrum on the plates, afford a unique opportunity of ascertaining the relative densities of the two stars and other data bearing on the question of double-star evolution. Dr. Baker finds that the diameter of either star is nearly six times that of the sun; that the brighter star (visual mag. = 5.0) is 7.5 as massive, but only one twenty-seventh as dense as the sun, while the fainter star (mag. 6.0) is 2.9 times as massive and one-seventieth as dense; that the centre of gravity of the system lies well within the surface of the brighter star, its mean distance from the centre of each body being 2,900,000 and 7,300,000 km., respectively, and that the surface brightness of the massive star is 2.5 times that of the other, although the spectra are practically identical. If the parallax were accurately known, it would be possible to determine, for this case, whether helium stars, such as these two are, or solar stars, have the greater surface brightness; assuming the parallax to be $0.02''$ or greater, it would appear that the surface brightness of the fainter star, at least, is less than that of our sun.

FORTHCOMING BOOKS OF SCIENCE.

AGRICULTURE.

A. and C. Black.—Wheat-growing in Canada, the United States, and the Argentine, W. P. Rutter, illustrated. *T. Werner Laurie.*—The Training of the Farmer, Dr. L. H. Bailey. *John Murray.*—Imperial Institute Series of Handbooks to the Commercial Resources of the Tropics, with special reference to British West Africa, issued under the authority of the Secretary of State for the Colonies, and edited by Dr. W. R. Dunstan, F.R.S.:—The Agricultural and Forest Products of British West Africa, G. C. Dudgeon, illustrated. *Swan Sonnenschein and Co., Ltd.*—Prosperous Agriculture: or Food Land and the Raw Material, F. W. Wateridge, illustrated.

ANTHROPOLOGY.

Macmillan and Co., Ltd.—The Golden Bough: a Study in Magic and Religion, Dr. J. G. Frazer, third edition, in 6 parts, Part i., The Magic Art and the Evolution of Kings, 2 vols.; The Baganda, a General Survey of their Country, Life, and Customs, Rev. J. Roscoe, illustrated; The Naga Tribes of Manipur, T. C. Hodson, illustrated. *John Murray.*—The Castes and Tribes of Eastern India, Sir H. Risley, K.C.I.E., C.S.I., illustrated. *The Oxford University Press.*—The Suk: their Language and Folklore, M. W. H. Beech, with introduction by Sir C. Eliot. *Swan Sonnenschein and Co., Ltd.*—Bushman Folk Lore, Miss L. C. Lloyd, with a preface by Dr. G. McCall Theal, illustrated.